Challenger some years ago this minute structure was looked upon as what is known to petrographers by the name of "fluxion-structure," such as may be seen in obsidian and other volcanic rocks, the ingredients of which have arranged themselves in layers or planes according to the direction in which the mass while still molten was moving. The same view was at first adopted and published by M. Renard. He now, however, expresses himself more doubtfully on the subject, and indeed is rather inclined to class the rock among the crystalline schists.

Now the importance of the point in question will be at once perceived when it is stated that if St. Paul's Rocks belong to the series of schists, they must once have lain deeply buried beneath overlying masses, by the removal of which they have been revealed. They would thus go far to prove the former existence of much higher and more extensive land in that region of the Atlantic; land too, not formed of mere volcanic protrusions, but built up of solid rock-masses, such as compose the framework of the continents. If, on the other hand, the rock is volcanic, then the islets of St. Paul belong to the same order as the oceanic islands all over the globe.

M. Renard reviews the arguments so cautiously that only towards the end do we discover him rather inclining to the side of the crystalline schists. With all deference to so competent an authority, however, we venture to maintain that the balance of proof is decidedly in favour of the volcanic origin of the rock. In the first place, as the distinguished Belgian petrographer himself admits, the law of analogy would lead us to expect the peridotite of St. Paul to be a volcanic protrusion. So cogent, indeed, is the argument on this head that, unless some irrefragable evidence against it is furnished by the rock itself, it must be allowed to decide the question. When the rock is studied under the microscope it presents precisely the banded fluxion-structure of true lavas, thus corroborating the inference of a volcanic origin for the mass. To say that this structure also resembles the foliation of true schists is to repeat what may be remarked of hundreds of examples of undoubtedly eruptive rocks. Unless some peculiarity can be shown to exist in the St. Paul's rock inconsistent with the idea of its being a volcanic extravasation, we are surely bound to regard it as no exception to the general rule that all oceanic islands are fundamentally of volcanic origin. M. Renard, however, fails to adduce any such peculiarity. He appears to have been led to doubt the validity of his first conclusions, and, be it also remarked, those of other observers, by finding so many published instances of peridotic rocks among the crystalline schists. A bed of peridotite among a group of schists, however, need not be of contemporaneous origin, any more than an intrusive sheet of basalt can be supposed to have been deposited at the same time and by the same processes that produced its associated sandstones and shales. Synchronism is not necessarily to be inferred from juxtaposition. We do not mean to dispute the assertion that some peridotites belong to the series of crystalline schists. But others are most assuredly eruptive rocks. It is among these that we should naturally seek for analogies with the rock of St. Paul.

To sum up the reasoning we may infer that, judging from the structure of other oceanic islands, the material comprising the rock of St. Paul should be of volcanic origin; this inference is confirmed by chemical and microscopical analysis, and especially by the discovery of a minute structure in the rock identical with that of many lavas, though a similar structure can be recognised in some schists; the islets of St. Paul furnish therefore no evidence of an ancient land having formerly existed in the middle of the Atlantic Ocean, on the contrary they have probably been built up on the submarine Atlantic ridge by long continued volcanic eruption like the other islands of the same Ocean.

The exhaustive methods of research employed by M. Renard in the study of the rock of St. Paul furnish an excellent illustration of the great strides made in recent years by petrography. The other rocks collected by the *Challenger* Expedition are to be treated in the same manner, but it is understood that instead of being thrown into separate Reports the petrographical details will be interspersed through the "Narrative" at the places where the localities are described. These contributions will form not the least important parts of this great work, the advent of which has been so long and so patiently waited for. ARCH. GEIKIE

THE LIFE OF CLERK MAXWELL

The Life of James Clerk Maxwell, with a Selection from his Correspondence and Occasional Writings, and a Sketch of his Contributions to Science. By Lewis Campbell, M.A., LL.D., Professor of Greek in the University of St. Andrews, and William Garnett, M.A., Late Fellow of St. John's College, Cambridge, Professor of Natural Philosophy in University College, Nottingham.

THIS volume will be heartily welcomed by all who knew Clerk Maxwell, and who cherish his memory, and by the still wider circle of those who derive pleasure and new vigour from the study of the lives and work of the great men that have gone before them.

The work consists of three parts, a biography with selections from Maxwell's correspondence, a popular account of his scientific work, and a selection from his poetry, both juvenile and of later years, including the serio-comic verses on scientific subjects, some of which are already so well known.

The biography is mainly the work of Prof. Lewis Campbell, whose schoolboy friendship and life-long intimacy with Maxwell amply qualified him for the task.

As far as vicissitudes of fortune are concerned, the life of Clerk Maxwell was absolutely uneventful. Worldly struggles he had none; from the very first he was warmly, if not always quite fully, appreciated by all whose good opinion he could have valued; promotion such as he cared for came almost unsought, and scientific distinction of the honorary kind was conferred upon him unstintedly while he lived to enjoy it. But in truth all these things moved his serene spirit as little as they disturbed his outward life; the interest of his biography lies in tracing the growth of a mind which was dedicated, literally from infancy, to the pursuit of science, and which nevertheless neglected nothing becoming a man to know. For unity of aim and singleness of heart, for high-minded neglect of the worldly strife that is begotten of vanity, ambition, or love of gain, for the steadfast pursuing of a path remote from the ways of ordinary men, the life of Maxwell stands in our mind associated with the lives of Gauss and Faraday. Nevertheless, without seeking to compare him with either of these great men in respect of intensity of genius, we may safely assert that he was superior to both in universality and many-sidedness. The mere objective circumstances of the career of such a man count for little, and the biographer tells his tale so far as these are concerned, with an artless grace that befits the subject. It is needless to dwell upon them here, for our readers have already been furnished with a summary of the outward events of Maxwell's life (NATURE, vol. xxi. p. 317). The interest and freshness of Prof. Campbell's story lie in the light it throws on the subjective influences that moulded the character of the gentle physicist, a character which was the most extraordinary combination, that this generation has seen, of practical wisdom, childlike faith, goodness of heart, metaphysical subtlety, and discursive oddity, with wonderful critical sagacity and penetrating scientific genius.

Intellectual power, and to some extent also eccentricity, appear to have been hereditary with Maxwell, as will be seen from the racy notes at the end of the first chapter on the Clerks of Penicuik and the Maxwells of Middlebie. After the early loss of his mother, he became the constant companion and confidant of his father, who initiated him into all his economic mysteries, interested him in applied sciences of every kind, encouraged his boyish essays in physical experimenting, and anxiously patronised his earliest memoir, on Cartesian Ovals and kindred curves, read to the Royal Society of Edinburgh by Forbes when its author was a boy of fourteen. This sympathy between father and son continued unbroken to the end, and had undoubtedly the happiest effect on Maxwell's destiny.

The chapters on the student life at Edinburgh and Cambridge are deeply interesting, and we earnestly commend them to the young men of our time who wish not to seem, but to be indeed, men of science.

With his appointment to the chair in the Marischal College, Aberdeen, begins his career as a recognised authority in scientific matters. Henceforth the biography is mainly an account of Maxwell's contributions to the advancement of physical science; the purely personal interest revives in the sad chapter that recounts his last illness and death.

Glimpses into his mental history during the later period of his life are afforded us by means of extracts from his intimate correspondence, and from essays, some read at Cambridge to a select circle of friends, others, not intended for publication even to that limited extent, but merely written as records of the author's communion with his own soul. We thus learn how the great physicist dealt with the grand problem of man's relation to that which went before, and that which shall be hereafter. It cannot but be profoundly interesting to read what was thought on such a subject by one of the greatest scientific minds of our day. We are left in no doubt as to the solution in which Maxwell ultimately reposed, and it is instructive to note how in this respect, as in so many others, he was akin to Faraday. Some will doubtless think that needless emphasis is laid upon the exact form of the final solution, and upon the precise methods by which it was reached. It must be remembered that the difficulties of the man of action and of the scientific man or professed thinker, are widely different. The former rests naturally in the arms of precept and dogma; he is distracted merely by the choice of preceptor and authority. The thinker by profession *must* examine for himself; it is a necessity of his nature so to do; and his difficulties arise from having to deal with matters in which the best of his scientific methods fail. Thus it happens that the example of a scientific mind is little likely to profit the unscientific; and that one scientific mind is scarcely in such matters to be led by the experience of another. The solutions of the great problem by different minds of the highest order have, as we know, differed, in outward appearance at least, very widely. But is it well to dwell on these differences? seeing that no man of finite intellect can tell how little or how great after all the distances may be that separate the resting places in the infinite of good men and true.

With regard to the selections from the correspondence it might have been better perhaps, in the interest of science, to have given more of the scientific correspondence. It must be known to many of our readers from pleasant experience that Maxwell was indefatigable in writing and answering letters on scientific subjects. His letters rarely failed to contain some sagacious criticism, some ingenious thought, or some valuable suggestion. Most possessors of such letters would we imagine be glad to put them at the disposal of a competent editor for publication, or at all events to take some steps to prevent the ultimate loss of matter so full of interest for all scientific men. Those that have read the volumes containing the correspondence of Gauss with Bessel and Schumacher will understand how instructive such collections can be.

Not the least interesting parts of the biography are the chapters containing extracts from the occasional essays already referred to. Maxwell when a student at Edinburgh had attended the lectures of Hamilton, and had been greatly impressed by that distinguished philosopher and accomplished enemy of the exact sciences. Accordingly, we find that among the studies of his earlier years mental and moral science had no small share. He resolves, for instance, at one period to read Kant and to make him agree with Hamilton, and, at the same time, he criticises in a somewhat unflattering strain the flaccid morality embodied in the lectures of Christopher North. It is not surprising, therefore, that the subjects of these occasional essays are mainly metaphysical or psychological. They are mostly very discursive, and their graver meaning is often veiled in a cloud of that humorous irony which figured so much in his familiar conversation. The general tendency is, however, sufficiently plain: in the essay on Psychophysik, for example, he thus delivers his opinion on the theory of "Plastidule Souls," which played so prominent a part lately in the classic duel between Virchow and Haeckel, and in sundry ultra-physical discussions nearer home:—

"To attribute life, sensation, and thought to objects in which these attributes are not established by sufficient evidence, is nothing more than the good old figure of personification."

At the end of the same essay he thus sums up the answers that have been given to the great ontological problem "What am I?":—

"In this search for information about myself from eminent thinkers of different types, I seem to have learnt one lesson, that all science and philosophy, and every form of human speech, is about objects capable of being perceived by the speaker and the hearer; and that when our thought pretends to deal with the Subject, it is really only dealing with an Object under a false name. The only proposition about the subject, namely, 'I am,' cannot be used in the same sense by any two of us, and, therefore, it can never become science at all."

Prof. Campbell has succeeded in presenting to us a most vivid picture of Maxwell's character. The view which he gives will be fresh, and partly strange, to many even of those who knew Maxwell well. It is no reproach to him to say that, in our opinion, he has by no means exhausted the different aspects of his subject. So many-sided was Maxwell's character, that it would have required the united efforts of several biographers to do it the fullest justice.

In the second part of the book will be found a good account by Mr. Garnett, of Maxwell's scientific work. Of this nothing further need be said, for an excellent summary has already been given in the pages of NATURE by Prof. Tait (vol. xxi. p. 317).

It may be questioned whether the literary merit of many of the pieces of occasional poetry in the third part will be sufficient to secure for them the interest of the general reader; but many will greet with pleasure the reappearance of old friends among the serio-comic verses. We are glad to find among them our favourite, "To the Committee of the Cayley Portrait Fund"; finer compliment to a mathematician surely never was penned. Among those hitherto unpublished may be mentioned the Paradoxical Ode to Hermann Stoffkraft, beginning as follows:—

My soul's an amphicheiral knot,
Upon a liquid vortex wrought
By Intellect, in the Unseen residing.
And thine doth like a convict sit,
With marlinspike untwisting it,
Only to find its knottiness abiding;
Since all the tools for its untying
In four-dimensioned space are lying,
Wherein thy fancy intersperses
Long avenues of universes,
While Klein and Clifford fill the void
With one finite, unbounded homaloid,[1]
And think the Infinite is now at last destroyed.

We ought to mention in conclusion that the book is beautifully illustrated; there are vignettes of Maxwell and of his father and mother; some quaint and suggestive illustrations of scenes from his early life, after originals by Mrs. Blackburn; and a variety of diagrams, several of them beautifully coloured, reproduced from originals—by Maxwell's own hand—in illustration of his researches on light and colour.

G. C.

OUR BOOK SHELF

Description Physique de la République Argentine d'après des Observations Personelles et Étrangères. Par le Dr. H. Burmeister. (Buenos Ayres, 1876-82.)

SOME account of the progress of this extensive work, in which the veteran naturalist, Dr. H. Burmeister, formerly of Halle, proposes to give a complete physical history of his adopted country, may not be unacceptable. Of the octavo text, which is accompanied by folio atlases, in order to give the illustrations on a large scale, we have seen four volumes, numbered 1, 2, 3, and 5. The fourth volume, which we suppose will contain the birds, is not yet issued, and the atlases in some cases do not appear to be complete.

The first volume (issued in 1876) is devoted to the history of the discovery and general geographical features of the Argentine Republic; and the second, published in the same year, to its climate and geological conformation. The third volume, of which the text was issued in 1879, has been already noticed in our columns (NATURE, vol. xxiv. p. 209). It contains an account of the Mammal-fauna both recent and extinct. We have now just received the first *livraison* of the folio atlas to this volume, containing a series of plates illustrating the whales of the Argentine coasts, a subject to which Dr. Burmeister has devoted special attention for many years. Of the fifth volume, devoted to the Lepidoptera of Buenos Ayres, we have already likewise spoken (see NATURE, vol. xx. p. 358).

It remains, therefore, for us only to wish the venerable author, who, for fifty years at least, has been a most energetic worker in many branches of zoology, health and strength to bring this important work to a conclusion.

Nomenclator Zoologicus. An Alphabetical list of all Generic names that have been employed by Naturalists for Recent and Fossil Animals, from the earliest Times to the close of the Year 1879. In two parts. I. Supplemental List. By Samuel H. Scudder. (Washington: Government Printing Office, 1882.)

EVERY working naturalist must be acquainted with Agassiz's "Nomenclator Zoologicus," published at Solothurn in 1846, which is, in fact, a dictionary of generic terms used in zoology. Without its valuable aid it is almost a fruitless task to endeavour to ascertain where or by what author any particular generic term has been instituted, or whether a generic term has been already used in zoology or not. Agassiz's work, in the preparation of which he was assisted by some of the best zoologists of the day, though by no means perfect in its manner of execution or free from occasional errors, answers very well for all practical purposes for genera established prior to the date of its preparation, and affords an excellent basis to work upon. It contains upwards of 32,000 entries of names of generic terms and of names of higher groups. In 1873 Graf A. v. Marschall, of Vienna, prepared and issued for the Imperial and Royal Zoological and Botanical Society of Austria, a supplementary volume, on something of the same plan. But to Marschall's "Nomenclator" no general index was attached, and, as those who have used the volume know full well, it is neither so accurate nor so complete as the work which it purports to supplement.

A new "Nomenclator Zoologicus," carrying the subject up to the present day, and correcting the errors and omissions of its two predecessors, has therefore long been a work of paramount importance to working naturalists. The question was who would undertake the ungrateful task, which was likely to confer neither fame nor fortune on the performer, and would be, above all others, long and laborious. Mr. Samuel H. Scudder of Boston, a well-known American entomologist, in response to appeals from his friends, has consented to devote his energies to the subject, and the first portion of his work is now before us.

The present part of the new Nomenclator is of a supplemental character, as is explained by Mr. Scudder in his preface, and contains "15,369 entries of genera established previous to 1880, not recorded, or erroneously given in the nomenclators of Agassiz and Marschall."

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[1] Here the author takes a poetic licence.